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Helping STEM Pioneers Succeed



College often presents a distinct series of hurdles for first-generation students. A group of Montclair State researchers recently received funding from the National Science Foundation (NSF) to address some of these barriers with a project that aims to increase science literacy and enrollment in STEM classes for first-year, first-generation students (those who are the first in their families to attend college).

Beginning in January, Biology Professor and Principal Investigator Dirk Vanderklein, along with Chemistry and Biochemistry Professor Nina Goodey, Earth and Environmental Studies Professor Joshua Galster, and Julie Dalley, Research Academy for University

Studying the Impacts of Dust From the World Trade Center



Anthony Correia/Getty Images

Chronic health conditions ranging from cancer to “World Trade Center cough” have been attributed to exposure to dust from the September 11, 2001, attack and collapse of the World Trade Center towers. Biology Professor Ann Marie DiLorenzo and her research team have been determining the impact of that dust on lung cells since 2007.

“Over the past years, my team has been able to pinpoint and publish papers on several cellular mechanisms thought to play a role in the decreased lung function of World Trade Center first responders,” DiLorenzo says.

Her work has focused on the combination of heavy metals — such as lead and zinc — present in a sample of dust taken from the Ground Zero site at Market Street in Manhattan that was given to her by the late Paul Lioy, a Rutgers professor and College of Science and Mathematics Advisory Board member. Her research exposes in vitro — or test tube — cultures of human lung cells to the Ground Zero dust.

“My student research teams have been focusing on trying to determine if the effects of the World Trade Center dust can be shown, with certainty, at the cellular level to cause apoptosis, or cell death, and carcinogenic genetic mutations,” she explains. “I try to find the specific location in a living cell where the toxic dust’s cocktail of chemicals is doing damage.” Such cellular damage would ultimately cause the decreased lung function seen in many first responders and area residents.

To date, DiLorenzo and her team have published four papers detailing the cellular effects of World Trade Center dust on human lung cells, including a

Fighting Childhood Obesity With Vegetables

Montclair State Psychology Professor Debra Zellner has been waging war against childhood obesity — and winning. Her recent

research projects have explored ways to combat obesity by getting kids to eat more vegetables. Her findings could prompt a rethinking of how school lunch programs could increase vegetable consumption.

Zellner teamed up with Philadelphia Chef Marc Vetri, whose Vetri Community Partnership runs “Eatiquette,” a groundbreaking elementary school lunch program, to determine that “coursed” meals and chef-prepared, family-style school lunches can increase students’ vegetable consumption.

In a study funded with a grant from the Barra Foundation and published in 2015, Zellner and Montclair State graduate Jennifer L. Cobuzzi showed that children will eat more vegetables if they are served before more popular fruit “desserts” in coursed meals.



“When we first served the fruit at the same time as the rest of the meal, some of the children reprimanded those who went for the fruit first, saying they should take the fruit later because it was dessert,” Zellner says. “Of course, most ate the fruit first anyway. However, the idea that fruit is a dessert and should be eaten after the meal was something that some students had learned.”

The team’s second study compared vegetable consumption and liking in children ages 8 to 10, who were served a traditional lunch service with those who participated in a family-style, adult-supervised “Eatiquette” program lunch.

Children in the “Eatiquette” program showed an increased consumption of and marked liking for vegetables — in this case, cauliflower. According to Zellner, anecdotal reports indicated that the children even asked to have it served at home.

“I started this research being rather skeptical that the program would have an effect on vegetable consumption,” Zellner recalls. “I was surprised at the impact the program had and how something as simple as serving the fruit as a dessert increased vegetable consumption.”

With funding from the Monell Chemical Senses Center of the Preston and Hilda Davis Foundation, Zellner is gearing up to study the impact of the adult at the “Eatiquette” table. “We think this is one of the most important components in increasing vegetable liking and consumption,” Zellner says. ■

Studying the Impacts of Dust From the World Trade Center
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2009 study implicating the dust in a decreased level of cell growth and an increased level of cell apoptosis.

A 2012 study suggested that the high alkalinity of the dust at Ground Zero contributed to the diminished lung function in World Trade Center workers and victims, while a 2013 report looked at how the synergistic effects of zinc and lead in the dust might contribute to respiratory illnesses.

“Our most recent 2016 publication presents evidence of the mutagenic effects of the toxic dust, which seems to indicate the serious connection to the development of cancers in exposed individuals,” she notes.

DiLorenzo’s research continues unabated. “We are designing experiments to precisely pinpoint what type

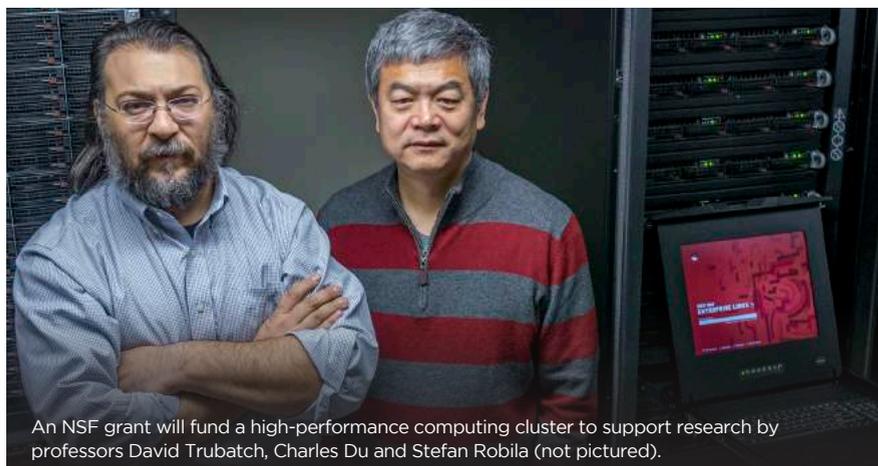


Ann Marie DiLorenzo and students are studying World Trade Center dust.

of damage is being caused by the toxic World Trade Center dust that then results in abnormal cell behavior.”

According to DiLorenzo, this work has broad implications for the future of cancer prevention, which relies heavily on developing models for identifying risks and tailoring prevention strategies based on genetic status. ■

Advancing Interdisciplinary Computational Research



An NSF grant will fund a high-performance computing cluster to support research by professors David Trubatch, Charles Du and Stefan Robila (not pictured).

An interdisciplinary team of Montclair State researchers led by Computer Science Professor Stefan Robila, Mathematical Sciences Professor David Trubatch and Biology Professor Charles Du recently received a \$497,000 National Science Foundation Major Research Instrumentation grant to purchase a high-performance computing (HPC) cluster.

the sequence assembly, annotation and mapping of millions of short reads of DNA data.

“Today, high-performance computing systems and software are critical in advancing knowledge in most scientific disciplines,” says Robila. “This award allows the University to enhance its computing

“It not only maintains, but actually increases, the momentum of computing-enabled research at Montclair State.” –David Trubatch

The HPC, slated for installation in January 2017, will support a wide range of research and educational activities of investigators from across the University. These include projects focused on everything from the realistic simulation of magnetic fluid flows to model magnetic drug targeting, from modeling, simulation and control of stochastic dynamics to automatic machine recognition of idiomatic and deceptive language.

“This powerful machine will greatly enhance my research productivity,” says Du, who is working on an NSF-funded genomics project involving

infrastructure and support cutting-edge research. By exposing students to the latest generation computing environments, it also gives them valuable hands-on, pre-professional experience.”

“The new system is a significant advance in computing capacity, with the specific computing needs of several on-campus researchers taken into account,” explains Trubatch. “It not only maintains, but actually increases, the momentum of computing-enabled research at Montclair State.” ■

Using Bacteria to Restore Contaminated Soil

Researchers are exploring how bacterial and fungal communities in contaminated soil in the Liberty State Park brownfield site can be harnessed to restore it.

Through a three-year, \$370,000 National Science Foundation grant, Chemistry and Biochemistry Professor Nina Goodey and Biology Professor Jennifer Kruminis are building on earlier research showing that microbial communities in the park’s soil can be surprisingly healthy and functional despite the presence of contaminants.



Liberty State Park brownfield site

The team recently began experimenting with mixing different contaminated soils to see if small amounts of high-functioning soils can restore function to poorly functioning ones.

“We hope to develop new practices of soil microbial community transplants — from healthy soils to degraded ones — that may increase soil functioning and health and ultimately aid in ecosystem restoration,” says Kruminis. “As urban land cover increases globally, the often unique ecosystems of urban areas will be central to the health of our human habitat.” ■

Studying a Chinese Herb's Effect on Cancer Cells

While traditional Chinese medicine for centuries has used triptolide, an extract of the Chinese herb known as “Thunder God Vine,” to treat inflammatory conditions like rheumatoid arthritis and autoimmune disorders, it also has powerful anticancer properties.

Biology Professor Reginald Halaby has been studying the herb's effects on breast cancer cells — the targets of chemotherapy, radiation, hormone therapy or other cancer-fighting protocols — that are resistant to apoptosis, or programmed cell death.

“We postulate that the results from our studies will lead to novel, effective anticancer treatments that specifically target tumor cells — while sparing healthy cells,” he explains.

Halaby notes that since cancer results from the uncontrollable

growth of normal, not foreign, cells, our immune system will not mount a response against them. Chemotherapy, which is nonspecific, kills all rapidly dividing cells — even healthy ones.

Halaby is building on previously funded research, which showed that minute concentrations of triptolide cause apoptosis in a human breast cancer cell lines. “Interestingly, triptolide is more potent than most chemotherapeutic drugs, which are administered at 1,000 times higher concentrations,” says Halaby.

His lab has demonstrated that triptolide causes cell death via a pathway involving tiny cellular organs known as lysosomes, which contain digestive enzymes that contribute to cellular degradation. Cancer cells have larger and more active lysosomes than normal cells.



“We've shown that triptolide targets the lysosomal membrane and causes it to become porous, allowing the digestive enzymes to enter the cell's cytoplasm,” he says. “This shift of lysosomal enzymes from lysosomes to the cytoplasm is sufficient to trigger cell death.”

Halaby's research indicates that this process, when triggered by triptolide, is an effective way to kill cancer cells that have evaded therapeutically induced apoptosis.

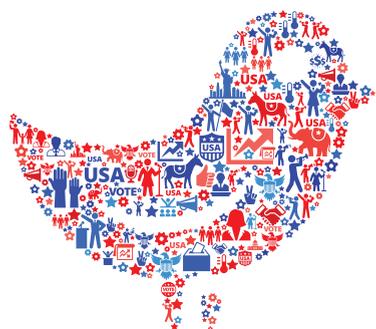
“We now plan to investigate the effects of triptolide on apoptosis in additional cancers, including prostate and ovarian tumor cell lines,” he says. ■

Social Media's Role in the 2016 Presidential Election

One big takeaway from the 2016 election is how powerful social media has become as a campaign tool — allowing candidates to both push out their message and respond directly to criticism.

Because of it, campaigning may never be the same, says Joel Penney, social media expert and assistant professor in the School of Communication and Media.

“In the past, candidates relied on the press to carry their attacks and counterattacks through traditional means of releasing statements, holding press conferences or going on talk shows. Now social media



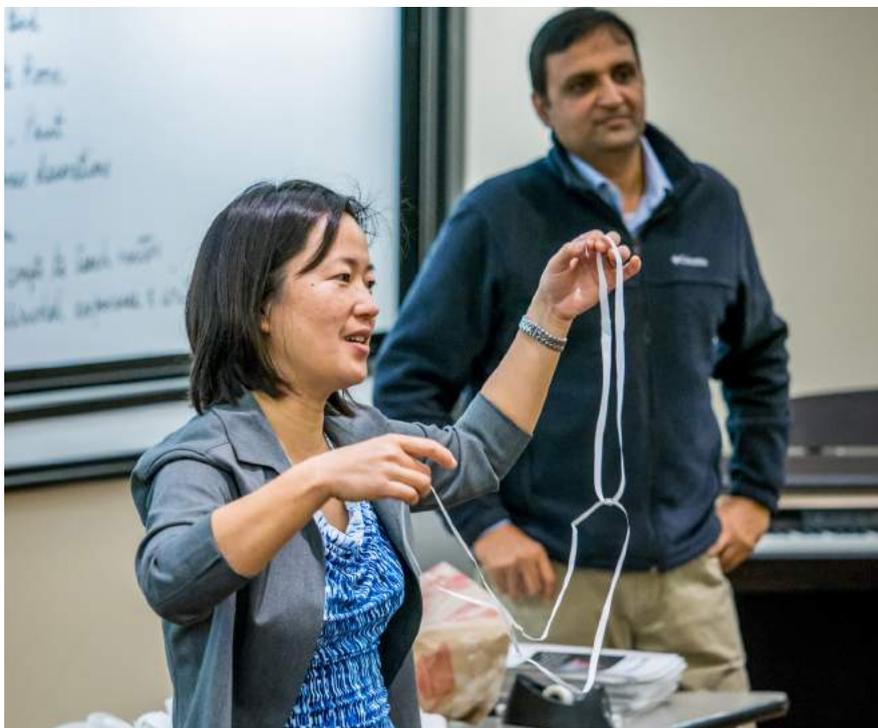
provides a direct conduit to the public without any journalistic intermediaries,” tying into the public relations principle of controlling the narrative, says Penney, who has been studying social media in politics since the 2008 election.

Overall, the election showed that platforms like Twitter empower

politicians while weakening the role of the press, Penney says, adding that Senator Bernie Sanders' popularity grew through social media, becoming one of the biggest social media stories of 2016.

“Sanders was relatively unknown when he entered the race, but he managed to build a surprising amount of support very quickly through social media promotion and electronic word-of-mouth, such as hashtags like #FeelTheBern,” says Penney. “The Sanders social media ‘movement’ really draws attention to the grassroots promotional power of social media.” ■

Fostering Creativity in Math and Science



Professors Mika Munakata and Ashuwin Vaidya teach creativity to STEM students.

Few people realize STEM fields are as inherently creative as the arts and other disciplines.

Mathematical sciences professors Mika Munakata and Ashuwin Vaidya hope to correct this misperception through a National Science Foundation-funded project called Engaged Learning through Creativity in Mathematics and Science.

“For this project, the biggest hurdle is learning to think about STEM subjects as being creative,” says Munakata. “Math isn’t just about finding the right answer.”

By opening students’ minds to the connections between math and science and other disciplines, the team will encourage them to explore the world in new ways.

“We are taking a thematic approach to understanding our world and are developing different modules to adapt and use in class,” says

Munakata. “It’s all about the process. We want students to be able to identify a problem — whether it is practical or whimsical — and then solve it creatively. We want them to get out of their comfort skills zone to be able to move forward and to pursue anything.”

Vaidya will kick off the three-year project by teaching a Gen Ed math course in the spring to non-math majors. Next fall, Vaidya and Munakata will co-teach a Student Experience course. By the project’s second year, they will recruit a group of about 30 Creativity Math Scholars, who will collaborate in interdisciplinary teams.

Mentored by faculty in different fields, the students will pose and explore complex problems through creative means. Workshop and visiting speaker events will provide insights into new ways of thinking and promote collaborations.

The professors are also partnering with Bergen Community College as well as area high schools. “We want to put creativity at the center of the education process from early on,” explains Vaidya. “Our hope is to create a network of science and math educators who are open to new ideas and different approaches — from middle school through college.” ■

“It’s all about the process. We want students to be able to identify a problem — whether it is practical or whimsical — and then solve it creatively.” —Mika Munakata



SPOTLIGHT: Events

Sustaining Local News and Journalists

How can local news providers survive in a rapidly evolving industry? In October, local news entrepreneurs and newspaper, television, radio and online journalists, along with business and academic leaders, addressed this and other questions at Sustain Local 2016, a two-day national conference hosted by the Center for Cooperative Media at Montclair State.

Focusing on local journalism sustainability, the conference addressed such hurdles as generating revenue and creating community and civic engagement. Sustain Local comprised panels, workshops and discussion sessions both on existing avenues and promising new technologies that support and sustain local news publishers. Panelists said the rewards of making a positive impact in communities that no longer have local newspapers far outweigh the challenges.

With funding from the Geraldine R. Dodge Foundation, the Center also hosted “Life After the Newsroom,” a networking event that included a discussion with journalists who were laid off or took buyouts and forged new or different career paths. ■

Women Entrepreneurship Week

Women Entrepreneurship Week, which began at Montclair State two years ago, went global in 2016 with events held on nearly 40 college campuses worldwide, including colleges in Australia, India, Chile, Nigeria and the United States.



Additionally, the State of New Jersey, honoring the movement created and organized by the Feliciano Center for Entrepreneurship, proclaimed October 15–22 as Women Entrepreneurship Week.

During Women Entrepreneurship Week the University hosted an evening panel discussion “Power Play: What Makes Great Women Leaders,” which focused on power and leadership, from juggling it all to taking risks, with a panel of distinguished guest speakers, including Kim Guadagno, Lt. Governor of New Jersey. ■

Dance for Film on Location

Celebrated choreographer Doug Elkins was on campus in mid-September shooting scenes for a short piece for Dance for Film on Location at Montclair State University.

Elkins is the third artist invited to create a 15-minute film for the project, which was developed by the Office of Arts and Cultural Programming with funding from The Andrew W. Mellon Foundation Choreographers on Campus initiative.

Elkins' film *A Hundred Indecisions*, which will debut during his live Peak Performances production on April 20, 2017, is the third and final work in the project.

“With Dance for Film on Location at Montclair State, we will have made three very different, yet groundbreaking, films,” says Executive Director for Arts and Cultural Programming Jedediah Wheeler. “Doug has a keen imagination and an idiosyncratic sense of dance. He’s humorous as well as innovative.” ■

Passaic River Symposium

Nearly 200 researchers, government employees, environmental professionals and students turned out for the seventh Passaic River Symposium in mid-October. The two-day event explored the many environmental management challenges

confronting efforts to achieve sustainability in the Passaic River Basin and other regional watersheds. Keynote speakers and presenters provided updates and future directions for the remediation and management of the Passaic River, highlighting the Lower



Passaic River Restoration Project and flood risk management. ■

The Search for Intelligence Autonomy

A science fiction world with autonomous aircraft — equipped with sophisticated sensors and onboard computers that gather and process data to make decisions and be able to perform without any human intervention — is about to become a reality with the help of Montclair State researchers.

“The Department of Defense wishes everything could be autonomous, from battle tanks to battleships — and even robot soldiers that can act like real human soldiers,” says Computer Science Professor Jing Peng. “But complete autonomy is not easy.” Peng and Linguistics Professor Anna Feldman recently received a Department of Defense-Air Force Office of Scientific Research grant for a project that



addresses the challenges facing autonomy.

The \$145,170 award will support the purchase of powerful computer and sensor equipment that will help the researchers — and a team of graduate and undergraduate students — develop a system that gathers information in real time by detecting and characterizing short- and long-term events and activities. The system will also provide a platform for dynamic data processing, exploitation and management.

According to Peng, the new Department of Defense award also supports and expands Peng and Feldman’s ongoing National Science Foundation-funded efforts in the area of natural language and text processing — such as callouts or chat data — by analysts who conduct wide area video surveillance. “Callouts or chat data are text that we want to leverage to help us detect events and activities over live video surveillance streams,” he explains.

Video surveillance is a key component of United States Air Force and other intelligence analysis.

“Complete autonomy is not easy.”
—Jing Peng

“When an unmanned aerial vehicle, or UAV, operates in a hostile environment, minimal communications with ground stations is a must,” says Peng. “This means we need the onboard capability to detect and characterize events and activities over live videos in such a way that only critical information — instead of every video frame — will be communicated to ground stations.”

By paving the way for autonomy, the team hopes to advance technology capable of gathering, analyzing, interpreting and protecting large amounts of diverse data to help with timely security decisions and policy making. ■

Helping STEM Pioneers Succeed continued from page 1

Learning’s assistant director, will work to provide a pathway to future STEM success for up to 200 first-generation students. The objectives of the project, funded by the NSF’s Department of Undergraduate Education, are to increase science literacy of undeclared, first-year, first-generation students and to encourage them to embark on STEM majors at the University.

The team hopes to achieve these goals with an integrated, three-pronged approach that includes a newly designed science literacy course; faculty and peer mentoring

activities that nurture a supportive environment for STEM study; and access to enhanced support and career counseling services from the University’s Center for Advising and Student Transitions (CAST).

The professors will work with the center to identify students who meet project criteria. The first cohort of students will begin in fall 2017 and will take the two-semester science literacy course.

“We’ll also create a new student learning community for each cohort of students called STEM Pioneers,” says Vanderklein. “It will offer

first-generation students with an interest in the sciences, but with no clear plan to pursue that interest, exposure to scientific inquiry and possibilities.”

Peer mentors and faculty who were first-generation students themselves will provide additional support built around belonging, learning and careers.

“During the course of this program, we hope to come up with materials that other institutions can use to improve the success of first-generation students in the sciences,” Vanderklein explains. ■

Tracking the Impact of Trauma

When Psychology Professor Sarah Lowe launched the MSU Trauma and Resilience Lab this semester, she had a clear mission: to “explore the long-term mental health consequences of a range of potentially traumatic life events.”

Researchers in her lab will look at pathways that lead from trauma to mental illness, as well as factors such as genetics and neighborhood characteristics, that shape trauma survivors’ resilience.

Researchers are working on numerous projects, including an on-campus study regarding Muslim-American students’ experiences of discrimination and a study with Psychology Professor Joshua Sandry to understand the neuropsychological correlation of PTSD among people with multiple sclerosis compared to those without it.

The lab has current funding through a National Institutes of Health grant to the Harvard T.H. Chan School of Public Health, supporting the research in which Lowe and her students are involved. “We’re analyzing the long-term patterns and predictors of post-traumatic stress among multinational studies of traumatic injury survivors from Israel, the Netherlands, Australia and Japan,” Lowe explains.

In spring 2017, the lab will receive funding from a subcontract award from Social and Scientific Systems, Inc., to support continued work on a longitudinal National Institute of Environmental Health Sciences study of mental health outcomes among those who helped clean up the Deepwater Horizon oil spill.



Mourners at a memorial for the victims in the 2015 Paris terror attacks

were posting from and decided to use that information to determine locations that could have elevated mental health symptoms,” she says.

When terrorists attacked Paris, Lowe’s team responded with an analysis of Twitter data from Paris during and after the attacks that documented post-attack

spatial clusters of fear and sadness.

“We hope our work, which was published in *The Lancet*, could be a starting point for researchers to draw on social media to identify geographic areas with enhanced mental health risks after traumatic events and to formulate post-trauma, community-based interventions.”

“We are engaged in work that spans beyond the boundaries of clinical psychology through our cross-disciplinary collaborators...”
—Sarah Lowe

Lowe’s ongoing study that focused on the role of community resources in shaping mental health in New York City in the wake of Superstorm Sandy has led to a collaboration with data scientists focused on accessing geographically linked Twitter data.

“We could tell where Twitter users

The lab is unique. Says Lowe: “We are engaged in work that spans beyond the boundaries of clinical psychology through our cross-disciplinary collaborators in fields such as psychiatry, epidemiology, public health, biostatistics and sociology.” ■

Building on a distinguished history dating back to 1908, Montclair State University is a leading institution of higher education in New Jersey. Designated a Research Doctoral University by the Carnegie Classification of Institutions of Higher Education, the University’s 10 colleges and schools serve 21,000 undergraduate and graduate students with more than 300 doctoral-, master’s- and baccalaureate-level programs. Situated on a beautiful, 252-acre suburban campus just 14 miles from New York City, Montclair State delivers the instructional and research resources of a large public university in a supportive, sophisticated and diverse academic environment.



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